

H5-262423

(43) Publication date October 12, 1993

(51) Int. Cl. ⁵	Identification codes	JPO file number	FI	Technical indications
B65G 47/52	D	8010-3F		
B23Q 7/16		7411-3C		
B65G 37/00	B	9244-3F		
Request for examination Not yet filed Number of claims 1 (Total of 6 pages)				

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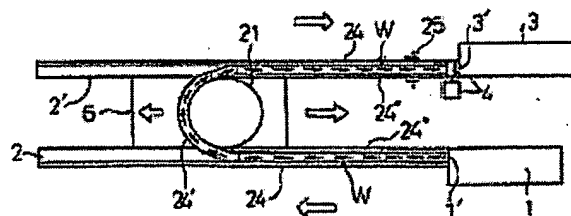
(54) (TITLE OF THE INVENTION) Workpiece Feeder with Buffering Mechanism

(57) (ABSTRACT) (contains corrections)

(PURPOSE) To provide a workpiece feeder with a buffering mechanism that can stably transport and supply workpieces where many need to be stored and some of the pieces may have a high center of gravity and be unstable.

(CONFIGURATION) It is equipped with an outer workpiece guide 24 that is fixed in place along the outside of the first conveyor 2 and a second conveyor 2' [sic] and an inside workpiece guide 24'' that guides the workpieces W by expanding and contracting according to the motion of the semicircular workpiece guide 24' up to the exit 1' of the individual unit feeder 1 or the intake port 3' of the single-row feeder 3. Because the workpieces support each other they do not fall off of the conveyor or topple over in the direction they are being transported. Even arcs that have a high center of gravity and are unstable can be transported without falling over. Furthermore, by causing the semicircular workpiece guide 24', the rotating plate 21 and the main unit 6 to move continuously, the number of workpieces held (buffering function) during one operating cycle of the single-row feeder 3 can be increased.

W	Workpiece	4	Shutter
1	Initial Unit Feeder	6	Main Unit
1'	Exit	21	Rotating Plate
2	First Conveyor	24	Outer Workpiece Guide
2'	Second Conveyor	24'	Semicircular Workpiece Guide
3	Single-Row Feeder	24''	Inner Workpiece Guide
3'	Intake Port	25	Count Sensor



(2)

(SCOPE OF PATENT CLAIMS)

(CLAIM 1) A workpiece-feeding device with a buffering mechanism characterized in that it is provided with an individual unit feeder that releases the pieces of work one at a time; a conveyor that transports the workpieces that are released from the individual unit feeder; a single-row feeder that receives a specific number of workpieces that are transported on the conveyor in a single cycle and repeatedly releases these workpieces in single rows; a semicircular workpiece guide that has a bottom surface and an outer surface that move the workpieces, straddling the space between the first conveyor and the second conveyor, where placed at the entrance of this single-row feeder is a shutter that closes while the single-row feeder is releasing one cycle's worth of workpieces, stopping the workpieces that have been transported over the conveyor and holding them at the entrance to the single-row feeder, and [this shutter] then opens while the single-row feeder receives one cycle's worth of workpieces, allowing the single-row feeder to receive the workpieces that have been held at the entrance to the feeder, [said workpiece feeder] has an individual unit feeder that releases workpieces continuously, the entrance to the single-row feeder is placed in the same direction as the exit of the individual unit feeder and there is a first conveyor, which transports the workpieces that are released from the individual unit feeder and a second conveyor that receives the workpieces for the single-row feeder arranged in parallel and with an intervening gap; a semicircular workpiece guide that has a bottom surface and an outer surface that move the workpieces that are transported by the first conveyor onto the second conveyor, straddling the space between the first conveyor and the second conveyor; a rotating plate that helps to guide the transportation of the aforementioned workpieces, turning along the inside of this semicircular guide, where the rotating plate and the aforementioned semicircular workpiece guide are integrated into a single unit; a moving means that changes the effective operating length of the first conveyor and the second conveyor by moving in both directions along these conveyors between the first and second conveyors; a control means that controls the operation of this moving means; an outside workpiece guide that is fixed along the outside of the first conveyor and the second conveyor; and an inside workpiece guide that guides the workpieces by expanding and contracting along with the movement of the semicircular workpiece guide running along the inside of the first conveyor and the second conveyor, from the aforementioned semicircular workpiece guide to the entrance of the single-row feeder or the feed port of the individual unit feeder.

(DETAILED DESCRIPTION OF THE INVENTION)

(0001)

(INDUSTRIAL FIELD OF THE INVENTION) This invention pertains to workpiece feeders that supply workpieces to production equipment. In particular, it pertains to workpiece feeders that have buffering mechanisms that adjust the accumulation of workpieces being supplied when there are changes in the number of workpieces to be processed, such as when there are problems with production equipment.

(0002)

(PRIOR ART) In recent years, demand has been growing for such features as improved cycles and thorough administration of quality in various types of production equipment. As part of this trend, there has been demand for improved supply speed, supply stability and flexibility in devices that supply workpieces.

(0003) We will explain conventional workpiece feeders based on Figure 7 and 8.

(0004) In Figures 7 and 8, conventional workpiece feeders have an individual feed unit 1 that releases the workpieces W at intervals and one at a time, a conveyor 40 that transports the workpieces W that come from the individual unit feeder 1 and a single-row feeder 3, which repeatedly receives a specific number of workpieces in a cycle from the workpieces being transported by the conveyor 40 and then releases these workpieces, and at the entrance to this single-row feeder 3 a shutter 4 that closes while the one cycle's worth of workpieces W are released by the single-row feeder 3, stops and holds the workpieces that have been transported by the conveyor 40 at the entrance to the single-row feeder 3, and then opens, when the single-row feeder 3 receives one cycle's worth of workpieces W.

(0005)

(PROBLEM TO BE SOLVED BY THE INVENTION) However, in the configuration in the conventional workpiece feeders described above, in order to adjust the amount of work W supplied with the amount of processing by the production equipment, the work W has to be released to the conveyor 40 at intervals and the work W accumulates at the shutter 4, which is arranged at the entrance to the single-row feeder 3.

(0006) Thus, the individual feed unit releases work one piece at a time, so when there is work W with an unstable center of gravity, because of the interval between neighboring pieces of work that are being transported, there is no stability, which leads to problems of work falling and breaking during transport.

(0007) Additionally, when the operation time for one cycle of the single-row feeder 3 increases because of production equipment processing speeds or other reasons, there is a problem of so much work accumulating on the conveyor belt 40 that it becomes impossible to hold any more pieces there.

(0008) The challenge for this invention is to provide a workpiece feeder with a buffering mechanism that can respond to the amount of work that must be held on the conveyor belt and adjust the holding capacity of that work while supplying work with an unstable center of gravity and solving the aforementioned problems.

(0009)

(MEANS FOR SOLVING THE PROBLEM) In order to solve the above problems, the workpiece feeder with a buffering mechanism of this invention is characterized in that it is provided with an individual unit feeder that releases the pieces of work one at a time; a conveyor that transports the workpieces that are released from the individual unit feeder; a single-row feeder that receives a specific number of workpieces that are transported on the conveyor in a single cycle and repeatedly releases these workpieces in single rows; a semicircular workpiece guide that has a bottom surface and an outer surface that move the workpieces, straddling the space between the first conveyor and the second conveyor, where placed at the entrance of this single-row feeder is a shutter that closes while the single-row feeder is releasing one cycle's worth of workpieces, stopping the workpieces that have been transported over the conveyor and holding them at the entrance to the single-row feeder, and [this shutter] then opens while the single-row feeder receives one cycle's worth of workpieces, allowing the single-row feeder to receive the workpieces that have been held at the entrance to the feeder, [said workpiece feeder] has an individual unit feeder that releases workpieces continuously, the entrance to the single-row feeder is placed

(3)

in the same direction as the exit of the individual unit feeder and there is a first conveyor, which transports the workpieces that are released from the individual unit feeder and a second conveyor that receives the workpieces for the single-row feeder arranged in parallel and with an intervening gap; a semicircular workpiece guide that has a bottom surface and an outer surface that move the workpieces that are transported by the first conveyor onto the second conveyor, straddling the space between the first conveyor and the second conveyor; a rotating plate that helps to guide the transportation of the aforementioned workpieces, turning along the inside of this semicircular guide, where the rotating plate and the aforementioned semicircular workpiece guide are integrated into a single unit; a moving means that changes the effective operating length of the first conveyor and the second conveyor by moving in both directions along these conveyors between the first and second conveyors; a control means that controls the operation of this moving means; an outside workpiece guide that is fixed along the outside of the first conveyor and the second conveyor; and an inside workpiece guide that guides the workpieces by expanding and contracting along with the movement of the semicircular workpiece guide running along the inside of the first conveyor and the second conveyor, from the aforementioned semicircular workpiece guide to the entrance of the single-row feeder or the feed port of the individual unit feeder.

(0010)

(OPERATION) The workpiece feeder with buffering mechanism of this invention has an outer workpiece guide that is fixed in place along the outside of the first conveyor and the second conveyor. It is also equipped with an inner workpiece guide along the inside of the first conveyor and second conveyor from the semicircular workpiece guide to the exit of the individual unit feeder that guides the workpieces by expanding and contracting along with the movement of the semicircular workpiece guide. This keeps the workpieces that are being transported over the conveyor from falling off and, because the individual unit feeder releases the workpieces continuously and without any gaps, there are no gaps between neighboring workpieces being transported on the conveyor. The workpieces thus support each other as they are being transported on the conveyor, which keeps them from toppling over. This allows stable transportation of even top-heavy workpieces.

(0011) Additionally, the workpiece feeder with buffering mechanism of this invention has a first conveyor that transports the workpieces released from the individual unit feeder and a second conveyor that delivers the workpieces to the single-row feeder that are placed in the same direction as the exit of the single unit feeder and the entrance to the single-row feeder. The conveyors are placed in parallel and with an intervening gap. Straddling the space between the first conveyor and the second conveyor is a semicircular workpiece guide that has a bottom surface and an outer surface that move the workpieces that are transported by the first conveyor onto the second conveyor. Turning along the inside of this semicircular guide is a rotating plate that helps to guide the transportation of the aforementioned workpieces. The rotating plate and the aforementioned semicircular workpiece guide are integrated into a single unit. Between the first and second conveyors is a moving means that changes the effective operating length of the first conveyor and the second conveyor by moving in both directions along these conveyors. There is a control means that controls the operation of this

moving means, which makes it possible to adjust the number of workpieces being held on the first and second conveyors, meaning that there will be no problems in the number of units held, even if the number being processed by the production equipment varies.

(0012)

(EXAMPLES OF EMBODIMENT) We will explain an example of embodiment of the workpiece feeder with buffering mechanism of this invention with reference to Figures 1 through 7.

(0013) The embodiment in Figure 1 is equipped with a main unit 6 that has the following features. An individual unit feeder 1 that releases workpieces W continuously and without a gap, a single-row feeder 3 that has an entrance 3' that is placed in the same orientation as the exit 1' of the individual unit feeder 1, a first conveyor 2 that transports the workpieces W that are released by the individual unit feeder 1, a second conveyor 2' that is placed parallel to the first conveyor 2 and with an intervening gap and delivers the workpieces W to the single-row feeder 3, a semicircular workpiece guide 24' that straddles the space between the first conveyor 2 and the second conveyor 2' that has an outer surface and a bottom surface that receive the workpieces W being transported by the first conveyor 2 and move them to the second conveyor 2', a rotating plate 21, which helps guide the aforementioned transportation operation by rotating along the inside of the semicircular workpiece guide 24', a moving means (not shown in Figure 1, see Figure 2) that changes the effective operating length of the first conveyor 2 and the second conveyor 2' by moving in both directions along the conveyors between the first conveyor 2 and the second conveyor 2' and which integrates the semicircular workpiece guide 24' and the rotating plate 21, a shutter 4 that is placed at the entrance 3' to the single-row feeder 3 and closes when the single-row feeder 3 is releasing one cycle's worth of workpieces W, stops and holds the workpieces that are being transported by the conveyors 2 and 2' at the entrance 3' to the single-row feeder 3 and then opens when the single-row feeder 3 receives a cycle's worth of workpieces W and delivers the workpieces W that had been held at the entrance 3' to the single row feeder 3, into the single-row feeder 3, a control means (not shown in Figure 1, see Figure 2) that controls the operation of the aforementioned transportation means and has a count sensor 25 that is placed near the entrance 3' to the single-row feeder 3, an outer workpiece guide 24 that is fixed in place along the outside of the first conveyor 2 and the second conveyor 2' as well as an inside workpiece guide 24'', along the inside of the first conveyor 2 and the second conveyor 2', that guides the workpieces W by expanding and contracting along with the movement of the semicircular workpiece guide 24' from the aforementioned semicircular guide 24' to the exit 1' of the individual unit feeder 1 or to the entrance 3' of the single-row feeder 3.

(0014) Next, we will use Figure 2 to explain the control means and the transport means in the embodiment shown in Figure 1.

(0015) In Figure 2, there is a housing 11 that houses the moving means (described below) that changes the effective length of the first conveyor 2 and the second conveyor 2' by moving in both directions between and along the first conveyor 2 and the second conveyor 2' as well as the semicircular guide 24', which is integrated with the rotating plate 21. In addition to supporting the housing 11 by means of the guide 10 and the

(4)

guide rails 10' the single-axis drive device 5 moves the main unit 6, which absorbs impact in transit by means of the urethane rubber stopper 7, spring 8 and shock absorber 9, in both directions between and along the first conveyor 2 and the second conveyor 2'.

(0016) In housing 11, the slide shaft 12 is placed so that it is parallel to the first conveyor 2 and the second conveyor 2'. The motor 16 is affixed to this slide shaft 12 over the slide bushing 13 and bracket 15. The rotating plate 21 is attached to this bracket 15 through the coupling 20.

(0017) The rotating plate 21 is integrated with the semicircular work guide 24' and it rotates along the inside of the semicircular work guide 24' and it moves in both directions between the first conveyor 2 and the second conveyor 2. The outside work guide 24 is fixed along the outside of the first conveyor 2 and the second conveyor 2.

(0018) Additionally, the aforementioned bracket 15 moves along the slide shaft 12, but it can be stopped at any point with the lock stopper 14, which is attached to the slide bushing 13. Also, a starting point sensor is located on the individual unit feeder 1 and single-row feeder 3 side on the inside surface of the housing 11 near the end of the slide shaft 12 and row sensor 18 is located on the semicircular workpiece guide 24' side. Additionally, the bracket 15 is pulled toward the aforementioned starting point sensor 17 along the aforementioned slide shaft 12 by the uniform tension spring 19. Note also that the count sensor 25 located near the entrance 3' (not shown in the diagram) to the single-row feeder 3 keeps trace of the number of workpieces W that have been received from the second conveyor 2 [sic].

(0019) Next, we will explain the operation of this embodiment based on the Figures 3 through 6.

(0020) Figure 3 shows the shutter 4 closed, the single-row feeder 3 releasing a single-row of one cycle's worth of workpieces W to the production equipment while the individual unit feeder 1 continues to release workpieces W onto the first conveyor. Figure 3 also shows the workpieces from the individual unit feeder as they are transported onto the first conveyor and that the force of their continued release moves the semicircular workpiece guide 24' and the rotating plate 21 toward the row sensor 18. This state continues in Figure 4. Note also that the inside workpiece guide 24" in Figure 1 has a dual-sliding construction that allows expansion and contraction. One end is affixed to the individual unit feeder 1 or to the single-row feeder 3 and the other end moves in concert with the semicircular workpiece guide 24' and the rotating plate 21. The inner workpiece guide 24" always guides the workpieces W from the individual unit feeder 1 or the single-row feeder 3 into the semicircular workpiece guide 24' and the rotating plate 21. Additionally, the individual unit feeder 1 releases the workpieces W continuously and when the semicircular workpiece guide 24' and the rotating plate 21 are moving, the motor 16 turns the rotating plate 21 and the rotation of the rotating plate 21 helps guide the moving workpieces W over the semicircular workpiece guide 24'.

(0021) Figure 4 shows the single-axis drive device 5 going into operation as the individual unit feeder 1 continues to release the workpieces W and those workpieces W are transported onto the first conveyor. This transporting force causes the semicircular workpiece guide 24' and the rotating plate 21 to move and when they reach the row sensor 18, the row sensor 18 turns on, at which point the row sensor 18 sends out an "on" signal. This state continues in Figure 5.

(0022) Figure 5 shows the state when the single axis drive device 5 is stopped by the ON signal from the starting point sensor 18, when the single axis drive device 5 goes into operation, the main unit 6 moves in the direction of the row sensor 18, the semicircular work guide 24' and the rotating plate 21 reach the starting point sensor 17 and the starting point sensor 18 turns on. Even in this state, the work W continues to be released by the individual unit feeder 1, that work W would be transported onto the first conveyor and the transporting force would move the semicircular work guide 24' and the rotating plate 21 in the direction of the row sensor 18.

(0023) The release, by the single-row feeder 3 of a single row of one cycle's worth of workpieces W to the production equipment shown in Figure 3, stops at the points depicted in any of Figures 3, 4, and 5 above. As shown in Figure 6, the shutter 4 opens and at that point, the individual unit feeder 1 stops releasing workpieces W, the lock stopper 14 goes into operation and the semicircular workpiece guide 24' and the rotating plate 21 stop at some position along the slide shaft 12. In this state, the single-axis drive device 5 moves the main unit to the starting point sensor 17 side and the workpieces W are fed into the single-row feeder 3. In this case, the distance moved by the main unit 6 is the length of the specific number of workpieces W supplied. Once the specific number of workpieces W has been supplied, the shutter 4 closes.

(0024) After the closing operation of this shutter 4, the operation in Figures 3 through 6 will be repeated.

(0025) In this embodiment, as noted above, the continuous movement of the semicircular work guide 24', the rotating plate 21 and the main unit 6 makes it possible for the amount of work W that can be held (buffering function) within one cycle of operation of the single-row feeder 3 to be increased. For this reason, if the one-cycle operation time of the single-row feeder 3 should increase due to a slowing down of the processing speed of the production equipment, and the amount that has to be held increases, the traditional problem of not being able to accommodate that can be solved.

(0026) Additionally, the semicircular work guide 24' and the rotating plate 21 will move under the force of the work W as it continues to be transported, so the space between the work W as it is transported will always be kept close and maintained at a constant pressure. The work W will always fill the conveyor and the guide, so even workpieces W that would be unstable individually can press up against each other and be transported stably without falling over.

(0027) The workpiece feeder with buffering mechanism of this invention is capable of various formats and is not limited to the embodiment described above. For example, the design of the conveyors, guides, transportation means, control means, sensors and other elements shutters may assume any design depending upon the purpose.

(0028)

(EFFECT OF THE INVENTION) The workpiece feeder with buffering mechanism of this invention has the following effect. It can increase the number of workpieces held (buffering function) in one operating cycle of the single-row feeder. In this way, the problem of insufficient holding of workpieces associated with traditional systems is solved and even if the processing speed of the production equipment should slow down for whatever reason and an operating cycle of the single-row feeder 3 should increase, the required number of workpieces can be secured and production can continue unobstructed.

(5)

(0029) Additionally, the workpiece feeder with buffering mechanism of this invention always keeps the workpieces W close together and at a constant pressure while they are being transported. The workpieces always fill the space on the conveyor and guide, so that even workpieces W that would be unstable individually, will support each other and be transported in a stable manner without falling over.

(BRIEF DESCRIPTION OF THE DRAWINGS)

(FIGURE 1) is a flat diagram of an embodiment of this invention.

(FIGURE 2) is an enlarged detail of the main elements in Figure 1.

(FIGURE 3) is an operating diagram of Figure 1.

(FIGURE 4) is an operating diagram of Figure 1.

(FIGURE 5) is an operating diagram of Figure 1.

(FIGURE 6) is an operating diagram of Figure 1.

(FIGURE 7) is a flat diagram of a conventional system.

(FIGURE 8) is a side view diagram of a conventional system.

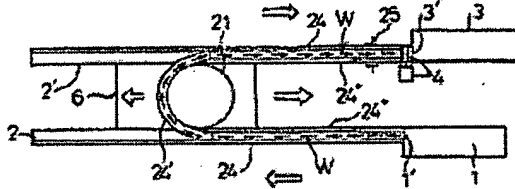
(EXPLANATION OF REFERENCES)

W	Workpiece
1	Initial Unit Feeder
1'	Exit
2	First Conveyor
2'	Second Conveyor

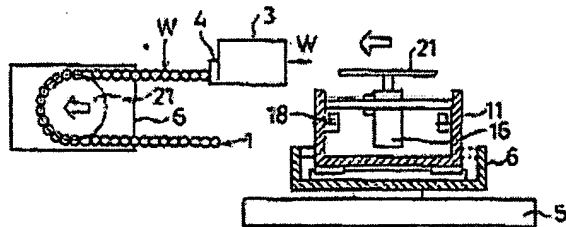
3	Single-Row Feeder
3'	Intake Port
4	Shutter
5	Single-Axis Drive Device
6	Main Unit
7	Stopper
8	Spring
9	Absorber
10	Guide
10'	Guide Rail
11	Housing
12	Slide Shaft
13	Slide Bushing
14	Lock Stopper
15	Bracket
16	Motor
17	Starting Point Sensor
18	Row Sensor
19	Uniform Tension Spring
20	Coupling
21	Rotating Plate
24	Outer Workpiece Guide
24'	Semicircular Workpiece Guide
24''	Inner Workpiece Guide
25	Count Sensor

(FIGURE 1)

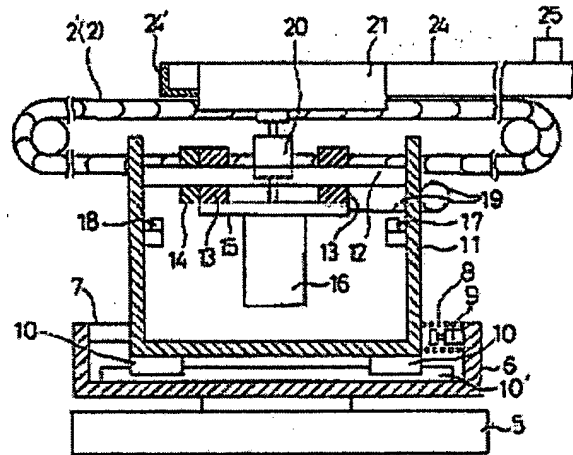
W	Workpiece
1	Initial Unit Feeder
1'	Exit
2	First Conveyor
2'	Second Conveyor
3	Single-Row Feeder
3'	Intake Port
4	Shutter
6	Main Unit
21	Rotating Plate
24	Outer Workpiece Guide
24'	Semicircular Workpiece Guide
24''	Inner Workpiece Guide
25	Count Sensor



(FIGURE 3)

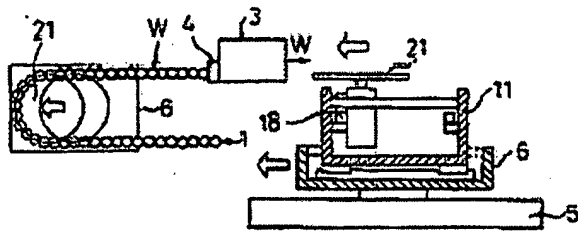


(FIGURE 2)

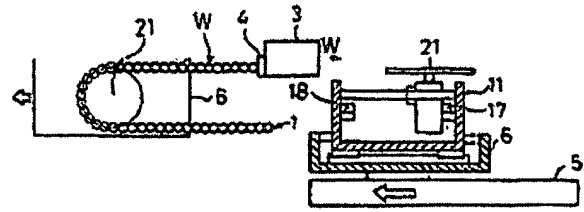


5	Single-Axis Drive Device
7	Stopper
8	Spring
9	Absorber
10	Guide
10'	Guide Rail
11	Housing
12	Slide Shaft
13	Slide Bushing
14	Lock Stopper
15	Bracket
16	Motor
17	Starting Point Sensor
18	Row Sensor
19	Uniform Tension Spring
20	Coupling

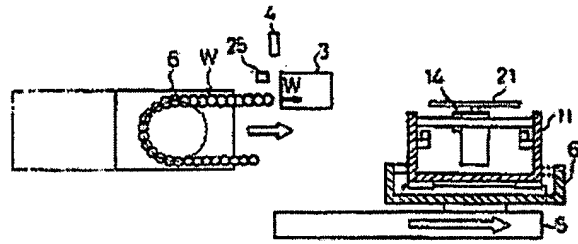
(FIGURE 4)



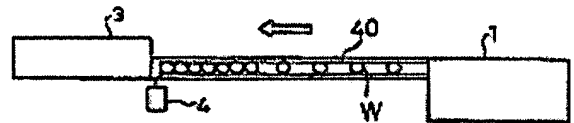
(FIGURE 5)



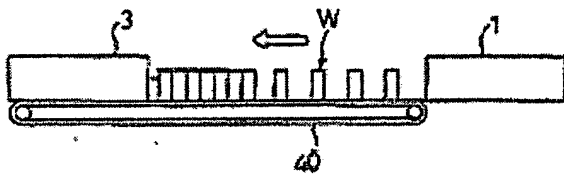
(FIGURE 6)



(FIGURE 7)



(FIGURE 8)



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PATENT ABSTRACTS OF JAPAN

(11)Publication number : 05-262423

(43)Date of publication of application : 12.10.1993

(51)Int.Cl.

B65G 47/52
B23Q 7/16
B65G 37/00

(21)Application number : 04-063373

(71)Applicant : MATSUSHITA ELECTRIC IND CO LTD

(22)Date of filing : 19.03.1992

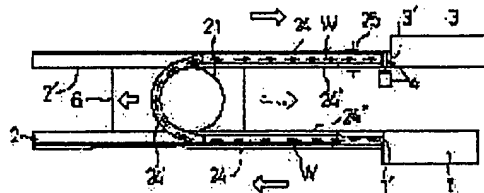
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(54) WORK FEEDER WITH BUFFER MECHANISM

(57)Abstract:

PURPOSE: To attain a work feeder with a buffer function which provides a large amount of work storage and carries and feeds even a work of unstable center of gravity with high stability.

CONSTITUTION: This work feeder is provided with an outside guide 24 for works fixedly-arranged along the outsides of the first conveyer 2 and the second conveyer 2, and an inside guide 24' for works which guides a work W by expanding or contracting with the movement of a semi-circular guide for works, ranging from a semi-circular guide 24' for works to the receiving part 3' of the discharge port 1' of a single discharging machine 1 or the receiving port 3' of a one-row discharging machine 3 along the insides of the first conveyer and the second conveyer 1'. Since the works do not incline to the outside of the conveyer, and support each other and do not incline in the carrying direction of the conveyer, even works of unstable center of gravity are delivered with high stability. Besides, the semi-circular guide 24' for works, a rotating plate 21 and a body 6 are moved continuously, so that it is possible to increase the storage amount (buffer function) of the works W within one cycle operation period of the one-row discharging machine 3.



LEGAL STATUS

[Date of request for examination] 11.09.1998

[Date of sending the examiner's decision of rejection] 10.04.2001

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

(51)Int.Cl. ⁸	識別記号	庁内整理番号	F I	技術表示箇所
B 6 5 G 47/52	D	8010-3F		
B 2 3 Q 7/16		7411-3C		
B 6 5 G 37/00	B	9244-3F		

審査請求 未請求 請求項の数1(全 6 頁)

(21)出願番号 特願平4-63373

(22)出願日 平成4年(1992)3月19日

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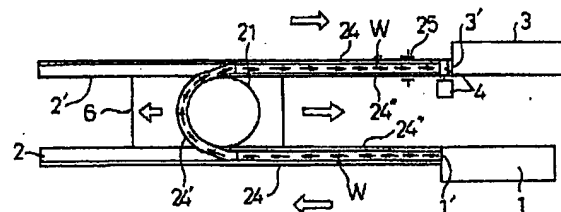
(54)【発明の名称】 バッファ機構付ワーク供給装置

(57)【要約】 (修正有)

【目的】 ワーク貯留量が大きく、重心不安定なワークでも安定して搬送・供給が可能なバッファ機構付ワーク供給装置を提供する。

【構成】 第1コンベア2と第2コンベア2の外側に沿って固定配置されたワーク用外側ガイド24と、第1コンベアと第2コンベアの内側に沿って、ワーク用半円形ガイド24'から単体排出機1の排出口1'又は一列排出機3の受入口3'までを、ワーク用半円形ガイドの移動に伴って伸縮してワークWをガイドするワーク用内側ガイド24''とを備える。ワークはコンベアの外側に倒れず、又ワークが相互に支え合ってコンベアの搬送方向に倒れないので、重心不安定なワークでも安定して搬送される。また、ワーク用半円形ガイド24'と回転板21と本体6とを連続的に移動させることで、一列排出機3の1サイクル動作時間内のワークWの貯留量(バッファ機能)が増大させられる。

W…ワーク
1…単体排出機
1'…排出口
2…第1コンベア
2'…第2コンベア
3…一列排出機
3'…受入口
4…開閉シャッター
6…本体
21…回転板
24…ワーク用外側ガイド
24'…ワーク用半円形ガイド
24''…ワーク用内側ガイド
25…カウントセンサ



【特許請求の範囲】

【請求項1】 ワークを1つずつ排出する単体排出機と、単体排出機から排出されたワークを搬送するコンベアーと、コンベアーで搬送されて来たワークから1サイクル分の所定数のワークを受けて、これらのワークを1列排出する動作を繰り返す1列排出機と、この1列排出機の受入口に配され、1列排出機が1サイクル分のワークを排出動作中は、閉じて、コンベアーで搬送されて来たワークを1列排出機の受入口に停止させて貯留し、1列排出機が1サイクル分のワークを受入れ中は、開いて、1列排出機の受入口で貯留していたワークを1列排出機に受入れさせる開閉シャッターとを有するワーク供給装置において、単体排出機はワークを間隔をおかず連続して排出する単体排出機とし、単体排出機の排出口と1列排出機の受入口とを同一方向に向けて配し、単体排出機から排出されるワークを搬送する第1コンベアーと1列排出機にワークを受け取らせる第2コンベアーとを間隔において平行に配し、第1コンベアー上から第2コンベアー上間に跨がって第1コンベアーが搬送してくるワークを受けて第2コンベアーに移載する底面及び外側面を有するワーク用半円形ガイドと、このワーク用半円形ガイドの内側に沿って回転し前記のワーク移載動作を補助ガイドする回転板と、前記ワーク用半円形ガイドと回転板とを一体的にして、第1コンベアーと第2コンベアー間をこれらコンベアーに沿って両方向に移動させて第1コンベアーと第2コンベアーの実効動作長を変える移動手段と、この移動手段の動作を制御する制御手段と、第1コンベアーと第2コンベアーの外側に沿って固定配置されたワーク用外側ガイドと、第1コンベアーと第2コンベアーの内側に沿って、前記ワーク用半円形ガイドから単体排出機の排出口又は1列排出機の受入口までを、ワーク用半円形ガイドの移動に伴って伸縮してワークをガイドするワーク用内側ガイドとを備えることを特徴とするパッファ機構付ワーク供給装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は、生産設備にワークを供給するワーク供給装置に関し、特に、生産設備のトラブル等で、ワーク処理量に変動があった場合に、供給ワークの貯留量を調整するパッファ機構付ワーク供給装置に関するものである。

【0002】

【従来の技術】 近年、各種生産設備において、タクト向上、品質管理の徹底等の種々の要望が増加し、これに伴って、ワーク供給装置にも、供給スピードの向上、供給の安定化、供給の融通性等の種々の要望が発生している。

【0003】 次に、ワーク供給装置の従来例を図7、図8に基づいて説明する。

【0004】 図7、図8において、従来例のワーク供給

装置は、ワークWを1つずつ間隔をおいて排出する単体排出機1と、単体排出機1から排出されたワークWを搬送するコンベアー40と、コンベアー40で搬送されて来たワークWから1サイクル分の所定数のワークWを受けて、これらのワークWを1列排出する動作を繰り返す1列排出機3と、この1列排出機3の入口に配され、1列排出機3が1サイクル分のワークWを排出動作中は、閉じて、コンベアー40で搬送されて来たワークWを1列排出機3の入口に停止させて貯留し、1列排出機3が1サイクル分のワークWを受入れ中は、開いて、1列排出機3の入口で貯留していたワークWを1列排出機3に受入れさせる開閉シャッター4とを有する。

【0005】

【発明が解決しようとする課題】 しかし、上記の従来例のワーク供給装置の構成では、生産設備の処理量とワークWの供給量とを調整するために、ワークWを間隔をおいてコンベアー40上に排出し、1列排出機3の入口に配されたシャッター4でワークWを貯留している。

【0006】 従って、単体排出機1はワークWを1つずつ間隔をおいて排出するので、重心不安定なワークWの場合には、隣接して搬送されるワークWの間に間隔があるために、安定性がなく、搬送中に転倒・破損するという問題点がある。

【0007】 又、生産設備の処理速度等との関係で、1列排出機3の1サイクルの動作時間が長くなった場合、コンベアー40上に貯留されるワーク量が過多となって貯留できなくなるという問題点がある。

【0008】 本発明は、上記の問題点を解決し、重心不安定なワークでも安定して供給することができ、コンベアー上に貯留の必要があるワーク量に応じて、ワークの貯留可能量を増減できるパッファ機構付ワーク供給装置を提供することを課題としている。

【0009】

【課題を解決するための手段】 本発明のパッファ機構付ワーク供給装置は、上記の問題点を解決するために、ワークを1つずつ排出する単体排出機と、単体排出機から排出されたワークを搬送するコンベアーと、コンベアーで搬送されて来たワークから1サイクル分の所定数のワークを受けて、これらのワークを1列排出する動作を繰り返す1列排出機と、この1列排出機の受入口に配され、1列排出機が1サイクル分のワークを排出動作中は、閉じて、コンベアーで搬送されて来たワークを1列排出機の受入口に停止させて貯留し、1列排出機が1サイクル分のワークを受入れ中は、開いて、1列排出機の受入口で貯留していたワークを1列排出機に受入れさせる開閉シャッターとを有するワーク供給装置において、単体排出機はワークを間隔をおかず連続して排出する単体排出機とし、単体排出機の排出口と1列排出機の受入口とを同一方向に向けて配し、単体排出機から排出されるワークを搬送する第1コンベアーと1列排出機にワーク

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を受け取らせる第2コンベアとを間隔をおいて平行に配し、第1コンベア上から第2コンベア上間に跨がって第1コンベアが搬送してくるワークを受けて第2コンベアに移載する底面及び外側面を有するワーク用半円形ガイドと、このワーク用半円形ガイドの内側に沿って回転し前記のワーク移載動作を補助ガイドする回転板と、前記ワーク用半円形ガイドと回転板とを一体的にして、第1コンベアと第2コンベア間をこれらコンベアに沿って両方向に移動させて第1コンベアと第2コンベアの実効動作長を変える移動手段と、この移動手段の動作を制御する制御手段と、第1コンベアと第2コンベアの外側に沿って固定配置されたワーク用外側ガイドと、第1コンベアと第2コンベアの内側に沿って、前記ワーク用半円形ガイドから単体排出機の排出口又は一列排出機の受入口までを、ワーク用半円形ガイドの移動に伴って伸縮してワークをガイドするワーク用内側ガイドとを備えることを特徴とする。

【0010】

【作用】本発明のバッファ機構付ワーク供給装置は、第1コンベアと第2コンベアの外側に沿って固定配置されたワーク用外側ガイドと、第1コンベアと第2コンベアの内側に沿って、ワーク用半円形ガイドから単体排出機の排出口又は一列排出機の受入口までを、ワーク用半円形ガイドの移動に伴って伸縮してワークをガイドするワーク用内側ガイドとを備えているので、コンベア上を搬送されているワークがコンベアの外側に倒れないことと、単体排出機はワークを間隔をおかず連続して排出するので、コンベアが搬送中の隣接ワーク間に間隔がなく、コンベア上を搬送されているワークが相互に支え合っ

てコンベアの搬送方向に倒れないこととによって、重心不安定なワークであっても、安定して搬送される。

【0011】又、本発明のバッファ機構付ワーク供給装置は、単体排出機の排出口と一列排出機の受入口とを同一方向に向けて配し、単体排出機から排出されるワークを搬送する第1コンベアと一列排出機にワークを受け取らせる第2コンベアとを間隔をおいて平行に配し、第1コンベア上から第2コンベア上間に跨がって第1コンベアが搬送してくるワークを受けて第2コンベアに移載するワーク用半円形ガイドと、このワーク用半円形ガイドの内側に沿って回転し前記のワーク移載動作を補助ガイドする回転板と、前記ワーク用半円形ガイドと回転板とを一体的にして、第1コンベアと第2コンベア間をこれらコンベアに沿って両方向に移動させて第1コンベアと第2コンベアの実効動作長を変える移動手段と、この移動手段の動作を制御する制御手段とを備えているので、第1コンベアと第2コンベアの実効動作長の変更によって、第1コンベア上と第2コンベア上のワークの貯留量の増減が可能になり、生産設備の処理量の変動しても、貯留量に問題が起きることは無い。

【0012】

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【実施例】本発明のバッファ機構付ワーク供給装置の一実施例を図1～図7に基づいて説明する。

【0013】図1において、本実施例は、ワークWを間隔をおかず連続して排出する単体排出機1と、単体排出機1の排出口1'と同一方向に向いた受入口3'を有する一列排出機3と、単体排出機1から排出されるワークWを搬送する第1コンベア2と、一列排出機3にワークWを受け取らせると共に第1コンベア2とは間隔をおいて平行に配されている第2コンベア2'と、第1コンベア2上から第2コンベア2'上間に跨がって第1コンベア2が搬送してくるワークWを受けて第2コンベア2'に移載する底面及び外側面を有するワーク用半円形ガイド24'と、このワーク用半円形ガイド24'の内側に沿って回転し前記の移載動作を補助ガイドする回転板21と、ワーク用半円形ガイド24'と回転板21とを一体的にして、第1コンベア2と第2コンベア2'間をこれらコンベアに沿って両方向に移動させて第1コンベア2と第2コンベア2'の実効動作長を変える移動手段

(図1には図示せず、図2参照)を備えた本体6と、一列排出機3の受入口3'に配され、一列排出機3が1サイクル分のワークWを排出動作中は、閉じて、コンベア2、2'で搬送されて来たワークWを一列排出機3の受入口3'に停止させて貯留し、一列排出機3が1サイクル分のワークWを受入れ中は、開いて、一列排出機3の受入口3'で貯留していたワークWを一列排出機3に受入れさせる開閉シャッター4と、一列排出機3の受入口3'の近傍に配されたカウントセンサ25を有し前記移動手段の動作を制御する制御手段(図1には図示せず、図2参照)と、第1コンベア2と第2コンベア2'の外側に沿って固定配置されたワーク用外側ガイド24と、第1コンベア2と第2コンベア2'の内側に沿って、前記ワーク用半円形ガイド24'から単体排出機1の排出口1'又は一列排出機3の受入口3'までを、ワーク用半円形ガイド24'の移動に伴って伸縮してワークWをガイドするワーク用内側ガイド24''とを備えている。

【0014】次に、図1に示す本実施例の移動手段と制御手段とを図2に基づいて説明する。

【0015】図2において、一軸駆動装置5が、ワーク用半円形ガイド24'と回転板21とを一体的にして、第1コンベア2と第2コンベア2'間をこれらコンベアに沿って両方向に移動させて第1コンベア2と第2コンベア2'の実効動作長を変える移動手段(後述)を内蔵するハウジング11と、このハウジング11をガイド10とガイドレール10'とを介して支持すると共に、ウレタンゴム製ストッパ7とバネ8とアブソーバ9とで移動時の衝撃を吸収する本体6とを、第1コンベア2と第2コンベア2'間をこれらコンベアに沿って両方向に移動させる。

【0016】ハウジング11内には、スライドシャフト

12が第1コンベア2と第2コンベア2'に対して平行に設けられ、このスライドシャフト12には、スライドブッシュ13とブラケット15とを介してモータ16が取り付けられている。このブラケット15にはカップリング20を介して回転板21が取り付けられている。

【0017】この回転板21はワーク用半円形ガイド24'の内側に沿って回転しワーク用半円形ガイド24'と一体的になって、第1コンベア2と第2コンベア2間を両方向に移動する。第1コンベア2と第2コンベア2の外側に沿ってワーク用外側ガイド24が固定されている。

【0018】そして、前記ブラケット15は、スライドシャフト12に沿って移動するが、任意の位置で、スライドブッシュ13に取り付けられたロックストッパ14によって、停止される。又、スライドシャフト12の端部近傍のハウジング11の内面の、単体排出機1及び一列排出機3側に原点センサが、ワーク用半円形ガイド24'側に行センサ18が配され、又、ブラケット15は一定張力のパネ19によって前記スライドシャフト12に沿って前記原点センサ17側に引っ張られている。

尚、一列排出機3の受入口3'（図示せず）近傍に配されるカウントセンサ25は、一列排出機3が第2コンベア2から受け取るワークWの数をカウントする。

【0019】次に、本実施例の動作を図3～図6に基づいて説明する。

【0020】図3は、開閉シャッター4が閉じ、一列排出機3が1サイクル分のワークWを生産設備に一列排出中で、単体排出機1がワークWを第1コンベア上に連続して排出している状態を示す。又、図3は、単体排出機1がワークWを連続して排出するその排出力で、ワークWは第1コンベア上を搬送され、この搬送力で、ワーク用半円形ガイド24'と回転板21とが、行センサ18側に移動して行くことを示し、この状態が図4に続く。

尚、図1に示すワーク用内側ガイド24''は、伸縮可能な2重スライド構造で、その一端は、単体排出機1又は一列排出機3側に固定され、他端はワーク用半円形ガイド24'及び回転板21と一体的に移動し、ワーク用内側ガイド24''は、常に、単体排出機1又は一列排出機3からワーク用半円形ガイド24'及び回転板21までのワークWをガイドする。又、単体排出機1がワークWを連続して排出し、ワーク用半円形ガイド24'と回転板21とが移動しているときには、モータ16が回転板21を回転し、回転板21の回転は、ワーク用半円形ガイド24'上をワークWが移動するのを補助ガイドする。

【0021】図4は、更に、単体排出機1がワークWを連続して排出し、そのワークWが第1コンベア上を搬送され、この搬送力で、ワーク用半円形ガイド24'と回転板21とが移動して、行センサ18まで到達し、行センサ18がON状態になり、行センサ18からのON信

号によって、一軸駆動装置5が作動した時点を示し、この状態が図5に続く。

【0022】図5は、一軸駆動装置5が作動して、本体6が行センサ18方向に移動し、ワーク用半円形ガイド24'と回転板21とが原点センサ17まで到達し、原点センサ18がON状態になり、原点センサ18からのON信号によって、一軸駆動装置5が停止した状態を示す。この状態でも、更に、単体排出機1のワークWの排出が続き、そのワークWが第1コンベア上を搬送され、この搬送力で、ワーク用半円形ガイド24'と回転板21とを、行センサ18方向に移動させる。

【0023】図3に示される一列排出機3の1サイクル分のワークWの生産設備への一列排出動作は、上記図3、図4、図5の何れかの時点で終了し、図6に示すように、開閉シャッター4が開く、この時点で、単体排出機1のワークWの排出が止まり、ロックストッパ14が作動して、ワーク用半円形ガイド24'と回転板21とが、スライドシャフト12上の任意の位置で停止する。この状態で、一軸駆動装置5が、本体6を、原点センサ17側に移動させて、ワークWを、一列排出機3に供給する。この場合の本体6の移動距離は、供給されるワークWの所定個数分の長さになり、所定個数のワークWの供給が終了すると、開閉シャッター4が閉じる。

【0024】この開閉シャッター4の開動作に続いて、図3～図6の動作が繰り返される。

【0025】本実施例では、上記のようにして、ワーク用半円形ガイド24'と回転板21と本体6との連続した移動によって、一列排出機3の1サイクル動作時間内のワークWの貯留量（バッファ機能）の増大が可能なので、生産設備の処理速度低下等で、一列排出機3の1サイクルの動作時間が長くなって必要貯留量が増加しても、従来例の貯留できなくなるという問題点を解消できる。

【0026】又、連続して搬送されて来るワークWの搬送力で、ワーク用半円形ガイド24'と回転板21とが移動するために、搬送中のワークW間は、常に、一定圧で密着した状態であり、コンベア上及びガイド上は、常に、ワークWで満杯状態なので、単独では不安定なワークWでも、相互に支え合って、倒れることなく、安定して搬送される。

【0027】本発明のバッファ機構付ワーク供給装置は、上記の実施例に限らず種々の態様が可能である。例えば、各種コンベア、各種ガイド、開閉シャッター、移動手段、制御手段、センサ等の設計は目的に合わせて自由に設計できる。

【0028】

【発明の効果】本発明のバッファ機構付ワーク供給装置は、一列排出機3の1サイクル動作時間内のワークWの貯留量（バッファ機能）の増大が可能なので、従来例のワークWの貯留量不足発生の問題点を解決し、何らかの

理由で、生産設備の処理速度が低下し、一列排出機3の1サイクルの動作時間が良くなっても、必要貯留量を確保でき、連続作業に支障を来さないという効果を奏する。

【0029】又、本発明のバッファ機構付ワーク供給装置は、搬送中のワークW間は、常に、一定圧で密着した状態であり、コンベア上及びガイド上は、常に、ワークWで満杯状態なので、単独では不安定なワークWでも、相互に支え合って、倒れることなく、安定して搬送されるという効果を奏する。

【図面の簡単な説明】

【図1】本発明の一実施例の平面図である。

【図2】図1の要部の一部拡大図である。

【図3】図1の動作図である。

【図4】図1の動作図である。

【図5】図1の動作図である。

【図6】図1の動作図である。

【図7】従来例の平面図である。

【図8】従来例の側面図である。

【符号の説明】

W ワーク

1 単体排出機

1' 排出口

2 第1コンベア

2' 第2コンベア

3 一列排出機

3' 受入口

4 開閉シャッター

5 一軸駆動装置

6 本体

7 ストッパー

8 バネ

9 アブソーバー

10 ガイド

10' ガイドレール

11 ハウジング

12 スライドシャフト

13 スライドブッシュ

14 ロックストッパー

15 ブラケット

16 モータ

17 原点センサ

18 行センサ

19 一定張力バネ

20 カップリング

21 回転板

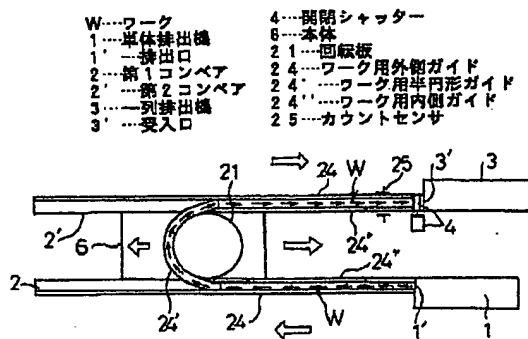
24 ワーク用外側ガイド

24' ワーク用半円形ガイド

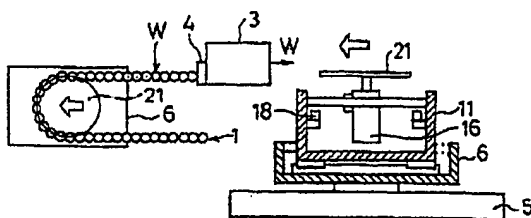
24'' ワーク用内側ガイド

25 カウントセンサ

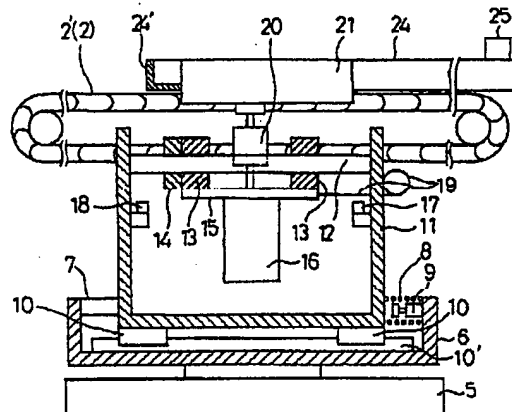
【図1】



【図3】

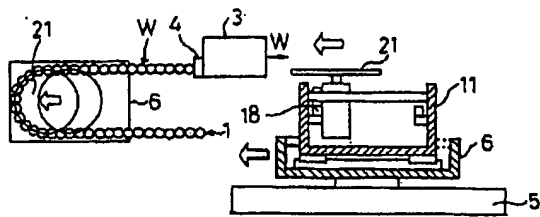


【図2】

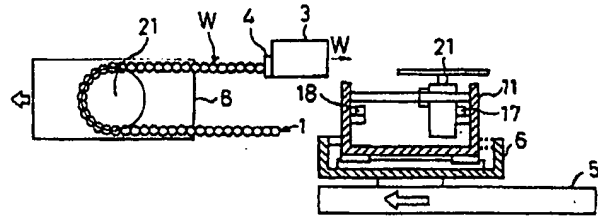


5 一軸駆動装置
7 ストッパー
8 バネ
9 アブソーバー
10 ガイド
10' ガイドレール
11 ハウジング
12 スライドシャフト
13 スライドブッシュ
14 ロックストッパー
15 ブラケット
16 モータ
17 原点センサ
18 行センサ
19 一定張力バネ
20 カップリング

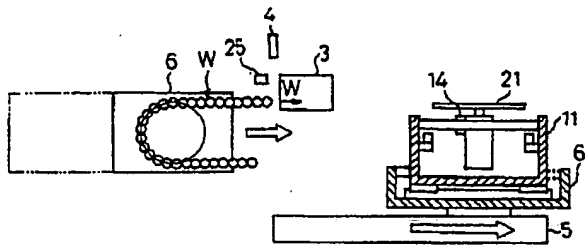
【図4】



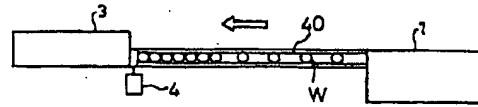
【図5】



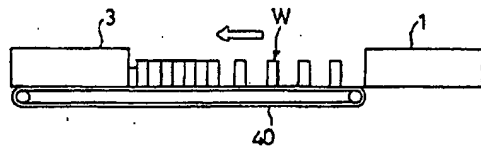
【図6】



【図7】



【図8】



フロントページの続き

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PATENT ABSTRACTS OF JAPAN

(11)Publication number : 05-286552

(43)Date of publication of application : 02.11.1993

(51)Int.Cl.

B65G 47/52

B65G 15/26

B65G 47/28

// B65G 21/14

B65G 43/08

(21)Application number : 04-095039

(71)Applicant : MATSUSHITA ELECTRIC IND CO
LTD

(22)Date of filing : 15.04.1992

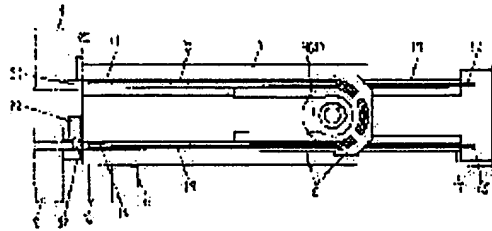
(72)Inventor : MINO YOSHIMITSU
ISHII YOSHIMICHI

(54) ROUND BELT CONVEYOR AND USE THEREOF

(57)Abstract:

PURPOSE: To provide a round belt conveyor which safely carries works without damages, is provided with the buffer function to change the hold-up volume of the works, and is preferable as a work supplying device.

CONSTITUTION: A belt conveyor is endlessly circulated through pulleys 8-15 provided to a movable frame 6 which is movable relative to a fixed frame 5 having an entrance 31 and an exit 32 of the conveyor, the fixed frame 5 and the movable frame 6. A round belt 17 to carry works to be carried thereon is provided between the passage from the entrance 31 to the exit 32 through the pulley 9 of the movable frame 6, and the movable frame 6 is moved according to the difference between the number of the carried works which flow into from the entrance 31 of the conveyor, and the number of the carried works which flow out of the exit 32, where the numbers are sensed by sensors 20, 21, and the round belt conveyor changes its conveyor length so that the works to be carried is always fully loaded between the entrance 31 and the exit 32.



LEGAL STATUS

[Date of request for examination]

09.12.1998

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

3084911

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